Using Predictive Modeling to Improve Outcomes

For Children in Allegheny County

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What is Predictive Risk Modeling?

- Use data **already collected** about each child to evaluate the possibility of future adverse outcomes

- Why consider predictive risk modeling?

  - Wider availability of high quality information about cross-sector service interactions that can inform our understanding of risk and protective factors

  - Advances in technology and analytic capabilities…we can use these data in real time rather than retrospective analyses

  - Growing appreciation that clinicians are often poor at weighting complex factors (and time is scarce!)

OPPORTUNITY #1:
Improving Child Welfare Decision Making

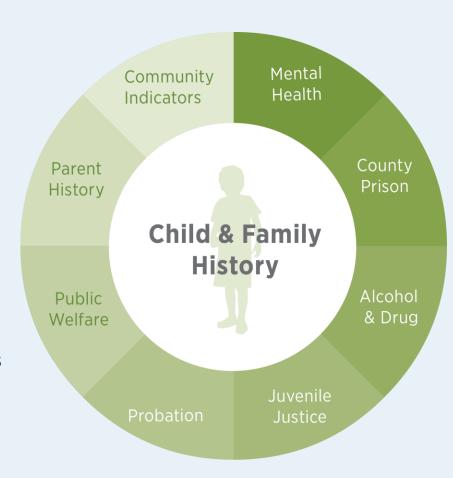**OPPORTUNITY #2:**
Rethinking Prevention of Child Abuse &Neglect

Screening Decisions & Outcomes

24,188
Index Referrals

53% (12,894)
Screened Out

35% (4,467)
Re-referred within a year

65% (8,418)
No Re-referrals

47% (11,214)
Screened In

24% (2,681)
Re-referred within a year

76% (8,533)
No Re-referrals

- In Allegheny County, rich data are available to case workers to help inform initial maltreatment screening decisions at the child protection hotline, but

  - No standardized protocols for using these data to make referral screening decisions

  - No method for systematically weighting this information in an equitable manner across all referrals

  - No understanding of what information is correlated / predicts future adverse outcomes for children

Child & Family History

Community Indicators
Mental Health
County Prison
Alcohol & Drug
Juvenile Justice
Probation
Public Welfare
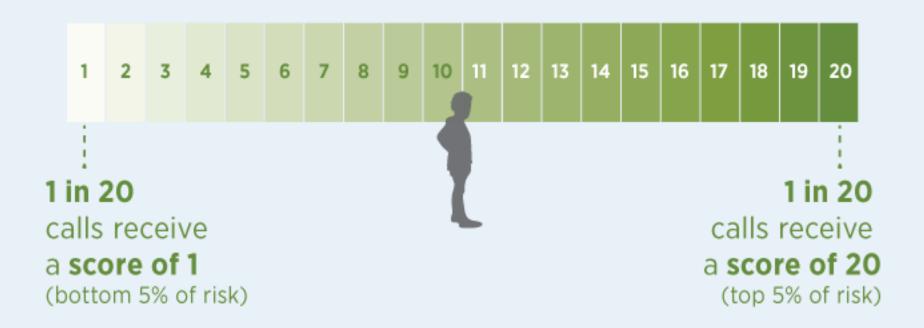Parent History

Developing a Screening Score

- The system will **harvest data from** the data warehouse*

- At each call, a **screening score** will be produced for each child associated with an allegation of maltreatment

- This screening score is comprised of the **risk of re-referral**, given screen-out and the **risk of placement in foster care**, given screen-in

- More than **100 pieces of information** are included in the screening model

Only if an MCI_ID is successfully established

Child & Family History
- Mental Health
- County Prison
- Alcohol & Drug
- Juvenile Justice
- Probation
- Public Welfare
- Parent History
- Community Indicators

Developing a Screening Score

- The **screening score** is from 1 to 20

- The **higher the score, the higher the chance of the future event** (e.g., abuse, placement, re-referral) according to the data

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

1 in 20
calls receive
a **score of 1**
(bottom 5% of risk)

1 in 20
calls receive
a **score of 20**
(top 5% of risk)

Researchers built a screening model based on information that we already collect

They identified more than 100 factors that predict future referral or placement

To test if the model might improve the accuracy of screening decisions, we **scored thousands of historical maltreatment calls** and **then followed the children in subsequent referrals to** see how often the model was correct...

1 in 10 children
with a score of 1 were re-referred
within two years of the call.

9 in 10 children
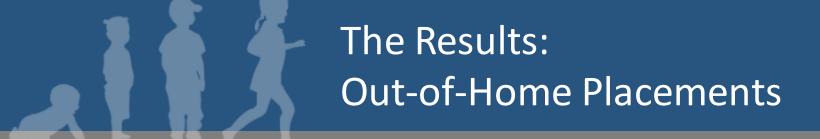with a score of 20 were re-referred
within two years of the call.

The Results:
Out-of-Home Placements

1 in 100 children who received **a score of 1 were placed out-of-home** within 2 years of the call

The Results:
Out-of-Home Placements

1 in 2 children who received **a score of 20 were placed out-of-home** within 2 years of the call

Under current practice:
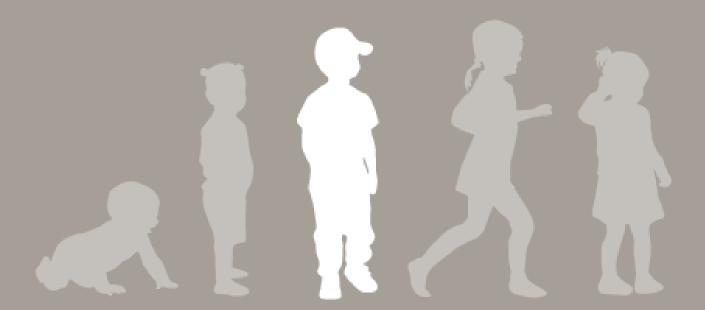
**27% of highest risk cases
were screened out —**
of these, **1 in 3 are re-referred
and placed** within 2 years of the
initial screened out call

**48% of lowest risk cases
were screened in —**
and yet only 1.4% of those
are placed within 2 years.

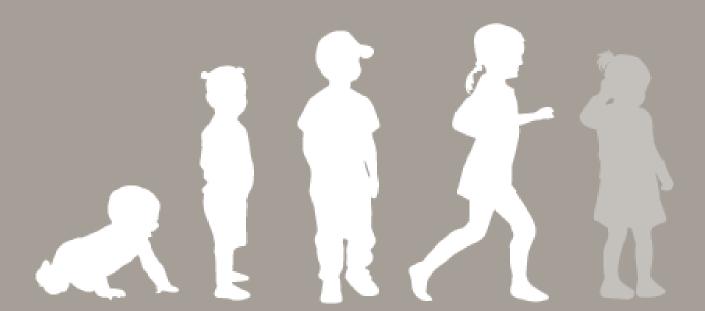**OPPORTUNITY #1:**
Improving Child Welfare Decision Making

OPPORTUNITY #2:
Rethinking Prevention of Child Abuse & Neglect

How well do our child serving systems **choose the right child at the right time?**

Not very well:

4 in 5 children in this county who died (or nearly died) as a result of abuse **were never referred** to child welfare before the incident.
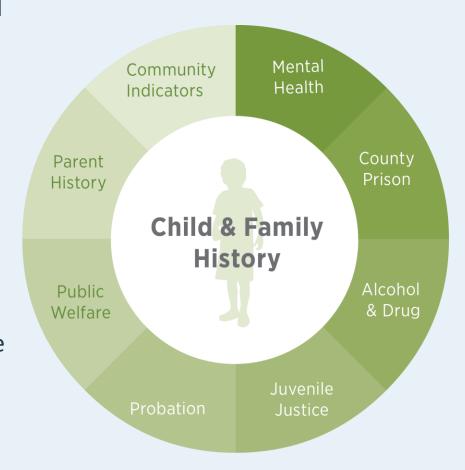
Generating a "Needs" Score at Birth

As **soon as the birth** is registered we could assign a needs score between 1 and 20

Predicting a child protection case opening **by age 3**
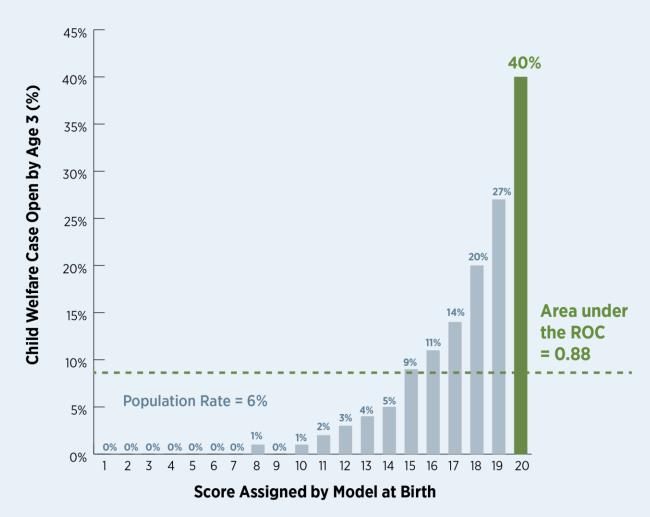
– Vision would be to prioritize high needs births for upstream early intervention support in the hopes of preventing the need for later child protection involvement

Community Indicators

Mental Health

Parent History

County Prison

Child & Family History

Public Welfare

Alcohol & Drug

Probation

Juvenile Justice

Generating a Score at Birth

Of those who received a risk score of 20, 40% of them resulted in an open case by age 3

Chart: "Child Welfare Case Open by Age 3 (%)" versus "Score Assigned by Model at Birth" (scores 1–20). Values: 1: 0%, 2: 0%, 3: 0%, 4: 0%, 5: 0%, 6: 0%, 7: 0%, 8: 1%, 9: 0%, 10: 1%, 11: 2%, 12: 3%, 13: 4%, 14: 5%, 15: 9%, 16: 11%, 17: 14%, 18: 20%, 19: 27%, 20: 40%. Population Rate = 6%. Area under the ROC = 0.88.

How do we know the model is identifying **truly high-risk children?**

We looked at **fatalities and near fatalities** that were reviewed under Act 33

There were **41 children who were victims** of maltreatment-related fatalities or near fatalities in the researched cohort (2007-2014)

We were able **to match 30 children** …

Of those 30 children, 12 are identified by our model as having been highest need at birth.

Only 6 of these children were ever referred to child protective services

50%

Opportunities for Prevention

Offer voluntary services at the time of birth

Use needs score to prioritize home visiting services through coordinated intake

Use needs score to provide extra support to familes who engage at a family support center

Proactively reach out to high-risk families who live in a catchment area for family support centers

Build needs score into screening at Children's Hospital

OPPORTUNITY #1:

Improving Child Welfare Decision Making

A Closer Look

Process Evaluation

– Assess implementation process

– Impact of screening scores on decision making

– Key questions:

- How has the tool modified the experience of call screeners?

- What are the practice and policy implications?

- What are perceptions and reactions to the tool?

- How extensive were preparations for development of the model?

– Primary methods: interviews, surveys, document review

Impact Evaluation

Impact on:

- Accuracy of decisions

- Reduction in unwarranted variation in decision-making

- Reduction in disparities

- Overall referral rates and workload

Outcomes assessed

- Rate of screen in

- Likelihood of "bad" screen-outs

- Likelihood of unnecessary screen-ins

- **Unwarranted variation in screening decisions**

- Disparity in screening decision

Questions

Next Steps

- Complete peer review

- Validation with Children's Hospital data

- Finalize visualizations

- Training

- Looking at resiliency/positive deviance

- Go-live July 1, 2016

- Evaluate

- Build 2.0 model, likely including likelihood of critical incident

- Continue exploring the "preventive model"

How this works

Child Welfare Allegation: Call Screening

Calls come into the child welfare call screening unit for processing, and a decision on next steps is made.

Example call:

Anonymous call is received from PA ChildLine

2 children (male aged 10, female aged 7) living with father and stepmother on weekends. Allegation states that stepmother "shoots heroin" and "leaves them alone to wander." Father sells marijuana and uses cocaine.

Client History Timelines
(Currently In Development)

For individuals linked to the incoming allegations, a visualization tool will comb the Data Warehouse for prior service involvement, and display it to the call screening worker.

Father:

County Jail	Medical Benefits	Child Welfare Case		Child Welfare Case
Jan 2008	Feb 2008	Nov 2008		Nov 2012

Mental Health Services — Nov 2012

Stepmother: Nov 2012

Predictive Risk Score
(Currently In Development)

100
75
50
25
0

As an additional piece of context, a predictive risk score will be calculated to assess whether the allegation data, along with other known risk factors for the family, suggest future adverse outcomes relevant to the children's welfare.

A "thermometer" icon like the one to the left is a type of display option that could be employed to portray the family's risk (final display options are still in development).

Referral Progression

Child Welfare Allegation: Call Screening

Call information received and processed	Timelines, Risk Score, and other research/context considered	Consultation with call screening supervisor

→ **Child Welfare Screening Decision**

→ Open Investigation

→ **Investigation Findings/ Service Decision**

→ Accept for Services (New child welfare case opens)

→ Do not accept for services, but provide family with information for other services or agencies they may find helpful

→ Do not open investigation, but provide family with information for other services or agencies they may find helpful